

# DEVELOPMENT OF SOUTH HILLS EXTENSION 2 AND SUBDIVISION OF ERF 1202 SOUTH HILLS

## OUTLINE SCHEME REPORT

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# DEVELOPMENT OF SOUTH HILLS EXTENSION 2 AND SUBDIVISION OF ERF 1202 SOUTH HILLS

## OUTLINE SCHEME REPORT

### 1. INTRODUCTION

#### 1.1. Purpose of this report

Bigen Africa Services (Pty) Ltd was appointed by Calgro M3 Holdings Ltd to plan and design the external and internal civil engineering services for the proposed South Hills Extension 2 and the subdivision of Erf 1202 South Hills. A layout plan can be seen in Annexure A2.

The purpose of this report is to agree with, and get the approval of the relevant authorities for the following:

- 1.1.1 Design criteria and standards for the design of water supply, sewerage, roads and stormwater drainage to the proposed development.
- 1.1.2 Connection to existing and proposed bulk and link services including the demand on those services.

In addition to the above, the estimated cost of the external and internal services is reported on and the proposed development programme is given. This will allow the Developer and the Local Authority to assess the impact and plan for the provision of services to the proposed development.

#### 1.2. Project Brief and Project Team

South Hills Extension 2 is an integrated development in the south of Johannesburg, implemented by Calgro M3 and Standard Bank as development partners.

The project will consist of 5 161 units - 1 830 Social / GAP, 1 750 fully subsidised RDP/BNG units and rental units and 1 609 freehold affordable housing units. Also included is the provision of facilities such as two government schools (Grade 0-12), a clinic, community centre, sports facilities, retail facilities, places of public worship, places of public transportation facilities and 50 areas of parks and open spaces.

South Hills Extension 2 will be developed on Holding 88 Klipriviersberg Estate Small Holding A.H. and Portion 65 (a portion of portion 7) of the farm Klipriviersberg No. 106 – I.R. The

property is also currently known as Moffat Park. The proposed township application is in line with the City of Johannesburg goals for the Moffat Park area, as was set out in the RSDF of 2010/2011. Construction of infrastructure expected to commence in 2012.

The project team comprises of professional companies (listed in Table 1.1) which are specialists in each of their respective fields of expertise.

**TABLE 1.1: The Professional Team**

Developer	Calgro M3 Holding Ltd 33 Ballyclare Drive, Ballywoods Office Park, Cedarwood House, Bryanston, Sandton Mr Karel Oberholzer	Tel: 0861 22 5476 Fax: 086 581 9735 <a href="mailto:Karel@calgrom3.com">Karel@calgrom3.com</a>
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## 2. SITE DESCRIPTION

### 2.1. Locality

The Site of approximately 199 hectares is located in the south east of Johannesburg, between the townships of South Hills, Risana, Linmeyer, The Hill, Rewlatch, Regents Park Estate en Klipriviersberg, approximately 6,5km south east of the Johannesburg CBD.

The proposed township is situated north of on South Rand Road (M38), Southern Klipriviersberg Road is abutting the property to the north, East Road abuts the proposed township on the western boundary and Nephin Road on the eastern boundary. Marjorie Street (M19) forms an intersection with Southern Klipriviersberg Road to the north of the proposed township.

The Development is situated in close proximity of the N12 Highway to the south and the N17 Highway to the north. The Reading Interchange to the south east of the property is located in close proximity and is accessible through South Rand Road.

### 2.2. Topography and Vegetation

The proposed property is situated between approximately 1677m and 1780m above sea level. The general slope direction is towards the north with an elevation difference of 103m. An existing drainage river cuts through the centre portion of the study area. The property has an average gradient of approximately 1:20 sloping towards the wetland areas and the Ridge. A valley is located in the middle of the property and falls from the south (highest point) to the north (lowest point) of the development. This has the result that the western section slopes to the northeast and the eastern section slopes towards the northwest towards the existing river. Areas with greater gradients than 1:4 are found on the property and will not be utilised for development.

Vegetation is very disturbed with rubble illegally dumped together with grass lands and areas along the wetland have some large trees.

### 2.3. Geotechnical

A geological investigation for the proposed township has been undertaken by the WSM Leshika Consulting (Pty) Ltd. The following geotechnical considerations that could influence the proposed development were identified and summarised:

The study area is mainly underlain by quartzite, conglomerate and sandy shale of the Turffontein Formation, Central Rand Group, Witwatersrand Supergroup. Conglomerate was encountered in the southern portion, with quartzite in the centre to northern portions. The study area is not

underlain by dolomite or chert which means that a dolomite stability investigation will not be required. Rock outcrops is evident throughout the majority of the study area. Where no rock outcrops are visible the area is generally characterised by a very thin topsoil, hillwash or pebble marker horizon underlain by a thin reworked residual horizon.

No shallow groundwater or seepage water was encountered in any of the test pits, but seasonal seepage water and saturated soil conditions can be expected towards the end of the rain season, especially during and after heavy or continuous downpours.

The main expected geotechnical constraints of the study area are:

- Shallow severe excavation difficulty.
- Areas with steep slope angles.
- Shallow seasonal seepage water and saturated conditions.
- Localised areas of uncontrolled and uncompacted fill.
- Upper thin collapsible / compressible soil horizon.

Based on the available information, the study area can be demarcated into the following four geotechnical zones (Areas are indicated in the Geotechnical Report):

Zone I: P (flooding) / 3FIL:

This zone is located within the 1:100 year flood line and is subject to flooding. No development may take place in this zone.

Zone II: P (steep slopes) – R / 3FI:

This zone is affected by steep slopes next to the drainage river and should be excluded from the development, due to cost implications for construction on steep slopes and severe excavation conditions due to shallow rock. The majority of this zone is also classified as environmentally sensitive.

Zone III: P (fill) – S2 / 3D:

This zone is affected by low density fill that can be replaced and re-compacted by inert material to design specifications prior to any development taking place. Development in this zone is therefore subject to a rehabilitation process.

Zone IV: S1-R / 2-3F 1AB 2E:

This zone is suitable for a residential development and normal foundations (strip footing or slab-on-the-ground construction) will be sufficient over the largest part of this zone. Good surface drainage will be necessary to prevent congress water flow and erosion of the upper sandy soil horizons.

### 3. TOWN PLANNING

The proposed township design was based on the Governments Breaking New Ground Principles. Urban design of the proposed township received an enormous amount of attention. This was done to ensure that a sustainable urban environment will be created for the community.

The Breaking New Ground principles of the Government have the vision to integrate communities to such an extent that they not only share infrastructure, but also social and economic opportunities within the same township. South Hills Extension 2 and the rezoning and subdivision of Erf 1202 South Hills have been designed with this in mind. Careful consideration has been given to the needs of the eventual residents of this area, but also the existing residents in the surrounding areas. Great consideration was given to the fact that the existing residents must not be alienated from the new social and economic opportunities that are created in the proposed township. Careful consideration was also given to the integration of the urban fabric and how the old will fit in with the new.

Access throughout the site was a high priority during design. Access is not only important to facilitate easy movement through the township by means of vehicular or pedestrian movement, but is also an important function of security in the proposed township. Pedestrian movement has been given a high priority and special pedestrian movement corridors have been identified and created to link the different sections and opportunities within the township via these links. Ample social amenities are provided within the new development layout. The existing sport facilities on the south west corner of the property are accommodated within erf 1128. These facilities will be formalized and thus will be granted the opportunity to expand to better suit the needs of the community.

Public Open Space forms an integral part of the design of the township. **57% of the area within the proposed layout is utilized for Public Open Space.** A large portion of this area is set aside due to environmental sensitivities and is thus protected against development. Public Open Space erven that's not environmentally sensitive are also provided to facilitate urban parks for the use of the community. A mix housing tenure is provided within the proposed layout. In the development the Residential 3, Sectional Title erven will be developed to accommodate the desired mix of RDP/BNG, Social, Gap and Affordable Housing opportunities. These will be developed to accommodate typologies of 2, 3, and 4 storey residential blocks. These blocks will accommodate a variety of different size units, depending on the market segment.

The Residential 1, Full Title erven will be developed to accommodate Gap- and Affordable Housing opportunities. These will be developed as free standing units on erven of 180m<sup>2</sup> to 350m<sup>2</sup>. The 140m<sup>2</sup> to 160m<sup>2</sup> erven will be developed as semi-detached housing units. Different size units ranging from 40m<sup>2</sup> to 120m<sup>2</sup> will be developed on the Residential 1 erven.

The proposed over all density of South Hills Extension 2 needs to be calculated with the proposed rezoning and subdivision of Erf 1202 South Hills. The combined **total of units** that is envisioned to be developed is **5 189 residential units**. The total area of the **combined site** is 161 8867m<sup>2</sup> (South Hills Extension 2) + 37 7444m<sup>2</sup> (Erf 1202 South Hills) = **199 6311m<sup>2</sup> or 199.6 hectares**. **The overall density of the proposed development is thus only 25.85 units per hectare.**

PROPERTY	OWNER	TITLE DEED	SIZE (ha)	JMC NO.
Erf 1202 South Hills	City of Johannesburg Metropolitan Municipality	T6082/1997	37.71	JMC014582
Holding 88 Klipriviersberg Estate Small Holdings	City of Johannesburg Metropolitan Municipality	T21254/1939	40.45	JMC018392
Portion 65 of the farm Klipriviersberg 106 IR	City of Johannesburg Metropolitan Municipality	T14062/1948	121.38	JMC015086
<b>Total</b>			<b>199.54</b>	

Through the planning process undertaken to date, and with the input of the key stakeholders into this process, the development is proposed to incorporate a suitable mix of housing typologies, as follows:

**TABLE 3.1: Housing Typologies**

TYPE	SOUTH HILLS EXTENSION 2		
	Nr of Stands	Nr of units	ESTIMATED AVERAGE STAND SIZES
<b>RDP / BNG Residential units</b>	50	1 750	2,3 & 4 Storey 40m <sup>2</sup>
<b>Social and GAP units</b>	38	1 830	2,3 & 4 Storey 40m <sup>2</sup>
<b>Bonded 140m<sup>2</sup> – 350m<sup>2</sup></b>	1 609	1 609	
<b>Educational</b>	2	2	
<b>Business</b>	1	1	
<b>Institutional</b>	12	12	
<b>Parks and P.O.S</b>	50	50	
<b>Total Stands</b>	<b>1 212</b>	<b>5 161</b>	

The rezoning subject to the subdivision will consist of 597 erven and public roads and are included in the above figures.



Erven 1/1202 to 550/1202	:	Residential 1	(550 erven)
Erven 551/1202 to 572/1202	:	Residential 3	(22 erven)
Erf 573/1202	:	Educational	(1 erf)
Erven 574/1202 to 577/1202	:	Institutional	(4 erven)
Erven 578/1202 to 597/1202	:	Public Open Space	(20 erven)

Various community services and facilities have been provided for in the layout. Provision has been made for adequate business, recreational and social sites in order for the integrated South Hills Extension 2 community to function as a sustainable human settlement, while promoting effective interaction with surrounding communities. The Layout plan is attached as Annexure A2.

#### 4. DESIGN GUIDELINES AND PHILOSOPHY

The Local Authority uses mainly their own standards in combination with publications of which the relevant one's are listed in Table 4.1, as design guidelines with variations to ensure that the most efficient civil engineering services are provided at the lowest long term cost.

**TABLE 4.1: Design Guidelines**

GUIDELINE REFERENCE	TITLE
A	"Guidelines and standards for the design and maintenance of water and sanitation services", published by the Investment Delivery Division of Johannesburg Water (Pty) Ltd
B	Johannesburg Roads Agency (Pty) Ltd: Guidelines on the Planning and Design of Township Roads and Stormwater Drainage
C	"Guidelines for the provision of engineering services and amenities in residential township development", issued by The Department of Housing in collaboration with The National Housing Board 1995.
D	The White Paper on Water and Sanitation.
E	Geotechnical Report done by WSM Leshika Consulting (Pty) Ltd.
F	The Standardized Specification for Civil Engineering Construction (SABS 1200), published by the South Africa Bureau of Standards

The design philosophy is that services should be provided at a level and cost affordable to the beneficiaries keeping in mind the nature of the site. The long term cost is the determining factor, i.e. including the cost of maintaining services when a suitable level is considered.

## 5. WATER SUPPLY

### 5.1. Authority and Provider Arrangements

The City of Johannesburg Metropolitan Municipality is in terms of the Water Services Act (Act No.108 of 1997), the Water Service Authority for the South Hills Extension 2 development.

As provided for in the above act, the City of Johannesburg Metropolitan Municipality entered into agreement with Johannesburg Water (Pty) Ltd, to fulfil the functions of the Water Service Provider in their area of jurisdiction.

### 5.2 Regional Supply

The proposed development falls within the previously developed South Hills district and will be provided from two Water Supply Districts. The bulk of the development will be supplied from the South Hills Water Supply District and only the north western portion (west of the stream) will be supplied from the Abattoir & Market Water Supply District.

The South Hills Water Supply District is supplied by the South Hills Tower situated in the south east corner of the proposed development. The Tower is supplied by the Rand Water's Meyer's Hill Reservoir by means of a pumpstation that needs to be upgraded from its existing capacity of 410 m<sup>3</sup>/hr to the peak discharge required of 595 m<sup>3</sup>/hr, according to the ultimate peak design model as stated in the Water Master Plan. Under the existing operating conditions, the South Hills Tower has insufficient capacity due to the insufficient capacity of the South Hills Pumpstation.

The Abattoir & Market Water Sub-District will feed the north western portion of the development and no upgrades required are expected. The demands of both portions of the development can be seen in section 5.5.

All bulk water services within the area have already been constructed. The bulk and link water supply system can be seen in Annexure B1.

### 5.3 Connection to Existing Bulk Services and proposed Upgrades

The development will connect at 6 locations to the existing water network. According to the master plan, the only upgrade required is to the pumpstation and a 160mm dia pipe for 254m in South Rand Road. The impact of the proposed development, the existing infrastructure and proposed upgrades needs to be confirmed by Johannesburg Water. The connection points are indicated on drawing nr. 1777.00.ZA.05.A003 and sizes and capacity are shown below in Table 5.1:

**TABLE 5.1: Connection to existing Water Network**

Connection nr.	Water District	Pipe Size	Peak Flow at Connection	Peak Pressure (m)	Demand Required (AADD – kℓ/day)
1	South Hills	300mm dia	91.5 ℓ/s	42.3 – 48.8	777
2	South Hills	225mm dia	35.3 ℓ/s	53 – 56.7	92
3	South Hills	225mm dia	35.3ℓ ℓ/s	53 – 56.7	325
4	South Hills	160mm dia	14 ℓ/s	60.1 - 72	912
5	Abattoir & Market	300mm dia	41.7 ℓ/s	88.9 – 96.7	705
6	Abattoir & Market	110mm dia	7.3 ℓ/s	34.6 – 49.1	698

### 5.4 Design Norms and Standards

For draw-offs directly into the reticulation a peak factor of 4 was adopted to determine the instantaneous peak flows (i.e. peak hour demands) anticipated. COJ by-laws relating to fire flow conditions will be adhered to. For residential (low risk) areas a fire flow of 38 ℓ/s (2,300 ℓ/min) is adopted while for industrial (moderate risk) areas a fire flow of 95 ℓ/s (5,750 ℓ/min) is utilised. A minimum hydrant delivery flow of 15 ℓ/s (900 ℓ/min) and 19 ℓ/s (1,150 ℓ/min) is utilised for each respective risk category.

Jo'burg Water's "service level 3" will be installed in the development. This level of service consists of a prepaid water connection to each erf with a connection to the top structures being provided. Details of the pre-paid erf connections will be finalised with Jo'burg Water's new Customer Connection Department during the detailed planning of each project phase. High density erven, institutional and sports facilities and schools will be supplied with a single bulk revenue meter.

The proposed water network of South Hills Extension 2 is displayed in the water layout plans, drawings 1777.00.ZA.05.A001 & 2 attached as Annexure B2. A total of approximately 14 466m uPVC class 12 internal and 2 065m uPVC link water pipes will be constructed. The design and positioning of valves, fire hydrants, PRV valves, chambers and other fittings will be dealt with in the detail design phase. The water design standards were also taken from *Table 4.1 Reference A* and are summarised in Table 5.2.

**TABLE 5.2: Water Design Standards**

	PARAMETER	ELEMENT	GUIDELINE
1.	Level of Service (High)	Water connection per unit	-
2.	Pressure	Maximum (Static) Minimum (at peak flow)	9,0 bar 2,0 bar
3.	Maximum Flow Velocities	dia ≤150 mm dia ≥ 200 mm	1,0 m/s – 3,5 m/s 1,5 m/s – 2,5 m/s
4.	Peak Factor	Design peak	4,0 x average annual daily demand
5.	Fire Conditions	Pipe Flow  Hydrant Flow  Hydrant spacing	38 l/s@ 0.7bar for residential 95 l/s @ 1.5bar for business, commercial, industrial 15 l/s 240 m maximum; residential 180m maximum, industrial
6.	Pipe Materials	Erf Connections Distribution main ≤ 200mm	HDPE Class 12 uPVC Class 12 with spigot and socketed couplings
7.	Pipe Size	Network Pipes Adjacent house connections House connections across street Business Connections	110 mm minimum 1 stand 25mm minimum 2 stands 32mm minimum 1 stand 25mm minimum 2-4 stands 32mm minimum 110 mm
8.	Valves	Type  Couplings	RS valves up to 350mm dia Gate valves over 350mm dia Flanged (Table 1600/3)
9.	Pipe Location	10.5 m Reserve 13 m Reserve 16 m Reserve 20 m Reserve	1,4 m from erf boundary 2 m from erf boundary 2 m from erf boundary 2 m from erf boundary (All on high side of road reserve)
12.	Cover to pipes	Minimum :Gravel roads Tarred roads and traffic areas Other areas Maximum :All areas	1 000mm 800mm 600mm 1 500mm
13.	Reservoir Storage Capacity	Gravity - Industrial Gravity – Other Pumped	45 hours 36hours 54 hours

All details for pipes, fitting, connections, etc. will be according to the standards of *Table 4.1 Reference A*.

### 5.5 Water Demands

The design of the bulk, link and internal reticulation required for the development will accommodate the ultimate demands anticipated. The total average annual daily demand (AADD) of the South Hills Extension 2 development project amounts to 2106 kℓ/day for the South Hills Water Supply District and 1403 kℓ/day for the Abattoir & Market District. The peak hour demand totals 297.5 ℓ/s and 64.95 ℓ/s respectively. The average daily water requirements have been estimated on a daily peak demand of 14Mℓ/day. The design demands used for this development is mostly derived from the guidelines proposed in *Table 4.1 Reference A* and are summarised below in table 5.3.

**TABLE 5.3: Water Design Demands**

Zoning	Unit demand	Units or erven	AADD (kℓ/d)	Flow (ℓ/s)	Design Peak Flow (ℓ/s) 4
2, 3 and 4 Storey BNG Residential Units	600 ℓ/unit/day	1 750 units	1 050	12.15	48.61
2, 3 and 4 Storey FSC Residential Units	600 ℓ/unit/day	1 830 units	1 098	12.71	50.83
140m <sup>2</sup> - 350m <sup>2</sup>	800 ℓ/stand/day	1 609 erven	1 287.2	14.90	59.6
Schools	15 000 ℓ/day/erf	2 erven	30	0.347	1.39
Business	20 000 ℓ/day/erf	1 erven	20	0.23	0.93
Municipal	2 000 ℓ/day/erf	12 erven	24	0.28	1.11
<b>Total =</b>			<b>3 509.2</b>	<b>40.617</b>	<b>162.468</b>

### 5.6 Proposed Water Supply Scheme

The proposed bulk and link water supply scheme layout is bound into Annexure B1 of this report. Water Layout Plans of the internal reticulation have been prepared and are included in Annexure B2 of this report. (See drawing 1777.00.ZA.05.A001 & 2).

A total of approximately 18.5km of bulk, link and internal water pipelines will be installed in South Hills Extension 2. Lengths of individual pipe diameters are indicated below in table 5.4 and table 5.5:

**TABLE 5.4: Water Pipe Network Lengths (Bulk and Link)**

Water Pipeline Size	Approximate Length
355mm dia	600 m
250mm dia	1 450 m

**TABLE 5.5: Water Pipe Network Lengths (Internal)**

Water Pipeline Size	Approximate Length
200mm dia	2 065 m
160mm dia	4 635 m
110mm dia	9 777 m

The internal network of South Hills Extension 2 will connect to the existing infrastructure at various positions. All water infrastructure (with the exception of the on-site services) will be laid in the road reserves or in municipal erven earmarked for this purpose.

## 6. SEWERAGE

### 6.1. Authority and Provider arrangements

The City of Johannesburg Metropolitan Municipality is in terms of the Water Services Act (Act No. 108 of 1997) the Water Service Authority for the South Hills Extension 2 development.

As provided for in the above Act, the City of Johannesburg Metropolitan Municipality entered into an agreement with Johannesburg (Jo'burg) Water (Pty) Ltd, to fulfil the functions of the Water Service Provider in their area of jurisdiction.

### 6.2. Existing Outfall and Wastewater Treatment Capacity

The proposed development falls in the South Eastern Drainage Basin and drains by means of the South East Upper Outfall through the Bushkoppies Waste Water Treatment Works (WWTW) on its way to the Olifantsvlei WWTW. A diversion structure at the Bushkoppies WWTW diverts a proportion of the flow to either works.

The treatment capacity of the Bushkoppies WWTW was 200 Ml/day at the time when the master plan was done and the capacity of the Olifantsvlei WWTW 180Ml/day.

It was however confirmed by Johannesburg Water that the treatment works; the outfall and collector mains have adequate capacity to meet the ultimate flow scenario of the development.

### 6.3. Connection to existing Bulk Services

The eastern development will connect at two locations to the existing network of South Hills, but 80% of the effluent will drain to the northern point at a low point next to the Klipriviersberg Road. The western portion will all drain to a proposed link line which will also drains to the same location as 80% of the eastern portion. Both portions will connect to the existing link sewer line which drains in a northern direction towards the main collector and South East Upper Outfall sewer.

The South Hills development will generate a peak flow of approximately 8.7 Ml/day once fully developed. See bulk sewer layout drawing 1777.00.ZA.06.A001 attached as Annexure C1.

### 6.4. Design Norms and Standards

Where available, Jo'burg Water standard details will be utilised. Where specific details are not available, these details will be prepared and submitted to Jo'burg Water for approval. Jo'burg Water's "Service Level 3" will be installed in the development.

This level of service consists of a waterborne sewer connection to each erf with a connection to the top structures to be provided. The layout of the proposed waterborne sewerage network for the South Hills Extension 2 development is shown on the Sewer Layout Plans, drawing 1777.00.ZA.06.A001 & 2, attached as Annexure C2. Approximately 17 km link and internal sewer reticulation pipes will be constructed. Link and internal sewers will mostly be located in the street reserve. The daily peak flow of sewerage that includes 15% storm water ingress is estimated on 3,49Ml/day. The design demands used for this development is mostly derived from the guidelines proposed in *Table 4.1 Reference A* and are summarized in Table 6.1.

**TABLE 6.1: Sewerage Design Demands**

Zoning	Unit demand	Units or Area (ha)	DWF (kℓ/d)	PDWF (ℓ/s)	PWWF (ℓ/s)
2, 3 and 4 Storey BNG Residential Units	600 ℓ/unit/day	1 750 units	1 050	30.38	34.9
2, 3 and 4 Storey FSC Residential Units	600 ℓ/unit/day	1 830 units	1 098	31.77	36.53
140m <sup>2</sup> - 350m <sup>2</sup> Bonded	800 ℓ/stand/day	1 609 erven	1 287.2	37.24	42.83
Schools	11 250 ℓ/day/erf)	2 erven	22.5	0.65	0.75
Business	15 000 ℓ/day/erf	1 erf	15	0.43	0.5
Municipal	1 600 ℓ/day/erf	12 erven	19.2	0.56	0.64
<b>Total =</b>			<b>3 491.90</b>	<b>101.03</b>	<b>116.15</b>



The sewerage design standards were also taken from *Table 4.1 Reference A* and are summarised in Table 6.2.

**TABLE 6.2: Sewerage Design Standards**

	PARAMETER	ELEMENT	GUIDELINES
1.	Minimum Pipe diameter	Gravity sewers	160 mm
		Connections	110 mm
2.	Minimum Velocity at full flow	Gravity sewers	0,7 m/s
		Rising mains	0,7 m/s
3.	Peak Factor	Residential	2.5
4.	Stormwater Infiltration		15% of design flow
5.	Pipe capacity	Flow level in pipe as percentage of diameter	67% at design flow
6.	Minimum Gradients for Pipes	100 mm dia	1 : 60
		150 mm dia	1 : 140
		200 mm dia	1 : 200
		300 mm dia and bigger	1 : 350
7.	Hydraulic Calculations	Manning Equation	n = 0,012
8.	Pipe Materials	All pipes	uPVC Class 34
9.	Location of Sewers	Street Reserve	
		10.5 Reserve	1m from road reserve boundaries
		13 m Reserve	2m from road reserve boundaries,
		16 m Reserve	2m from road reserve boundaries
		20 m Reserve	2m from road reserve boundaries (All on low side of road reserve)
10.	Connections	For Stands	110 mm uPVC with slip on couplings
11.	Cover over pipe	In road reserves	1 400mm (min)
		Other areas	1 000mm (min)
12.	Manholes	Spacing	80 m maximum.

## 7. ROADS

### 7.1. Authority and Provider Arrangements

City of Johannesburg (COJ) has appointed Johannesburg Roads Agency (JRA) as its agent for the provision and maintenance of roads within its municipal area.

### 7.2. Design Standards

All roads reserves have been designed with the minimum standards for road reserve in mined as set out by the Johannesburg Roads Agency. The minimum road reserve width provided is 10,5m wide. These roads are intended for access purposes to individual Residential 1 erven only. All Residential 3 erven obtain access from roads with a minimum road reserve of 13m & 16m wide. All social, educational and business facilities obtain access from road reserves with a minimum width of 13m. The largest road reserve provided within the township is 16m wide.

The design criteria are based on the design standards of the Johannesburg Roads Agency and the Guidelines for the Provision of Engineering Services and Amenities in Residential Township Development, and are shown in Table 7.1. The criteria are given for the various road classes on relevant road reserve widths. Typical cross sections of the roads are shown on drawing 1777.00.ZA.03.D001, attached as Annexure D3.

**TABLE 7.1: Road Design Criteria**

Parameter	ROAD CATEGORY				
	District Distributors Class 3	Local Distributors (Bus Routes) Class 4	Residential Access Collector Class 5a	Residential Access Loop Class 5b	
Road Reserve Width	32 m	20 m	16 m	13 m	10.5 m
Carriage Way Width	2 x 8 m	7 m	6 m	6 m	5 m
Minimum Centre Line Radii for Angles of Deflection less than 60°	205 m	150 m	120 m	15 m	10 m
Minimum Centre Line Radii for Angles of Deflection 60° and More	50 m	50 m	50 m	15 m	15 m
Roadway shoulders	1.8 m	1.8 m	1.8 m	1.1 m	-
Desired Maximum Speed	80 km/h	60 km/h	50 km/h	40 km/h	40 km/h

Parameter	ROAD CATEGORY				
	District Distributors Class 3	Local Distributors (Bus Routes) Class 4	Residential Access Collector Class 5a		Residential Access Loop Class 5b
Minimum Stopping Distances	95 m	85 m	65 m	45 m	45 m
Minimum Gradient	0,5 %	0,5 %	0,5 %	0,5 %	0,5 %
Maximum Gradient	7 %	7 %	10 %	12.5 %	12.5 %
Minimum K-value	16	12	12	6	6
Minimum Vertical Curve	100 m	40 m	30 m	30 m	20 m
Cross Fall/Camber	2 % camber	2 % camber	2 % camber	2 % cross fall	2 % cross fall
Super Elevation	4 %	4 %	2 %	N/A	N/A

As far as is possible Jo'burg Roads standard details will be utilised on the project. Where specific details are not available, these details will be prepared and submitted to Jo'burg Roads for their approval.

Typical road cross-sections for the various road classes have been prepared and are included as Annexure D3. The cross-sections are based on Jo'burg Roads standards.

### 7.3. Pavement Design

District Distributor roads are considered Category UA roads with a material depth influence of 1 000 mm below the finished level. Local distributor roads Class 4 can be considered as Category UB roads. As such the material depth, which is the depth below the finished level of the road to which soil characteristics have a significant effect on pavement behaviour, will be 800mm. The other roads are all class 5 roads and are considered category UC and UD roads. The material depth in this case is 600mm and 400mm.

Testing of the in-situ material along the centre line of the streets has not yet been carried out. The pavement design will be determined once these results are available and suitable borrow areas have been identified.

Preliminary pavement designs have been prepared for each road category is given below in Tables 7.2 and can be seen in the road cross section drawing attached as Annexure D3.

**TABLE 7.2: Pavement Design - Surfacing, Base and Sub-Base**

Parameter	District Distributors Class 3	Local Distributors Class 4	Residential Access Collector Class 5a	Residential Access Loop Class 5b
Traffic Class	E3	E1	E0	E0
Category	UA	UB	UC	UD
Structural Design Traffic	< 1.2 X 10 <sup>6</sup>	< 0.8 X 10 <sup>6</sup>	< 0.2 X 10 <sup>6</sup>	< 0.2 X 10 <sup>6</sup>
Wearing course	40mm Asphalt	40mm Asphalt	30mm Asphalt	30mm Asphalt
Base	150 G1	150 G1	150 G1	150 G1
Sub-base	125 C3	150 C4	150 C4	150 C4
	125 C4			
Upper-selected	150 G7	150 G7	150 G7	N/A
Lower-selected	150 G9	150 G9	N/A	N/A
Sub-grade (Roadbed)	Rip, Recompact & Shape	Rip, Recompact & Shape	Rip, Recompact & Shape	Rip, Recompact & Shape

### 7.4. Access

The Development is situated in between the N12 highway to the south and the N17 highway to the north. Access to the proposed South Hills Extension 2 development will be provided from the existing roads bordering the site.

The most important regional routes providing access to the above mentioned roads are the Sybrand van Niekerk FWY (R59) from the N12 through the Reading Interchange in the south and Marjorie Street (M19) which forms an intersection with Southern Klipriviersberg Road from the N17 in the north. The Reading Interchange is accessible via South Rand Road (M38).

The study area has existing developed roads on all sides from where access to the site is available. The following roads are adjacent to the study area:

- South Rand Road to the south;
- From East Road to the west, three new accesses will be created with the intersection of Milkwood Road, Buffalo Thorn road & Weeping Willow Road;
- Two intersections on Southern Klipriviersberg Road; and
- 5 accesses in Nephin Road to the east;

The majority of the roads are in a fair to good condition but the pavements, walkways and pedestrian space need upgrading and maintenance particularly in nodes where pedestrian

volumes are high. Roads around the parkland will have to be improved before development commences.

The in-depth discussion of the access routes can be seen in the traffic impact study done by Mariteng Management Solutions.

## 7.5. Link and Internal Roads

Link roads are classified as those on 16m reserves and wider with no access to stands. No individual access will be provided along these roads as far as possible. Southern Klipriviersberg has been classified as a Mobility Road (Class 3) and South Rand Road has been classified as a Mobility Spine (Class 2). Along both Mobility Spines and Mobility Roads higher density residential development is supported. The upgrading of these roads will be discussed in the traffic impact study.

The internal road network hierarchy for the development is shown on the Roads Layout Plan attached as Annexure D2. Access roads on 13m reserves are classified as Class 5a roads and 10.5m reserves as Class 5b roads. All streets will be surfaced. The approximate length of roads is indicated in table 7.3.

**TABLE 7.3: Approximate road lengths**

Road reserve	Road width (m)	Approximate length
20 m	6 m	60 m
16 m	6 m	6 353 m
13 m	5.5 m	6 172 m
10.5 m	5 m	4 943 m

## 7.6. Traffic Flow and Public Transport

### 7.6.1. Traffic Studies

Mariteng Management Solutions was appointed by Calgro M3 Holdings Ltd to investigate the impact of the proposed development, including all the extensions of South Hills Extension 2, on the surrounding road network and to make recommendations regarding the upgrading that may be required due to the proposed development. During the study, particular attention was paid to the following:

- Confirmation of road hierarchy proposed in the approved spatial development framework plan;
- Calculation of roadway and reserve widths;

- Placing of public transportation facilities and determination and public routes within the development; and
- Providing recommendations on the location of pedestrian bridges and the provision of footpaths and sidewalks within the road reserves.

The traffic impact study report will be submitted separately to Jo'burg Roads and COJ.

### 7.6.2. Bus and Taxi Services

COJ has as part of their Integrated Transport Plan (ITP), developed a network of public transport routes. These routes are collectively known as COJ's Strategic Public Transport Network (SPTN).

Southern Klipriviersberg Road is part of the Strategic Public Transport Network (SPTN), which is based on a network of routes along the City's primary Mobility Spines linking and enhancing accessibility between residential departure points and nodal destination points (RSDF 201/2011). Southern Klipriviersberg Road has been earmarked to form part of the proposed Bus Rapid Transit (BRT).

BRT is not a move away from the SPTN, but a more bold system based on similar principles to the SPTN. Aspects of the SPTN have been retained to work in conjunction with BRT systems and routes.

Bus lay-byes will be provided at strategic positions on the bus routes for use by both busses and taxis. Locations of the proposed lay-byes will be finalised at design stage.

Taxis form part of the public transport system and as such have been incorporated in the design of the development.

## 8 STORMWATER

### 8.1 Stormwater Run-off Zones

Currently storm water on the proposed site drains by means of the perennial stream bisecting the area from south to north.

The drainage pattern is divided into two distinct zones. The bulk roads serve as the main stormwater cut-offs. Run-off zones are therefore small and minimize the concentration of stormwater run-off within the development. The Run off areas can be seen on drawing nr. 1777.00.ZA.04.A004, attached as Annexure E2.

## 8.2 Drainage Philosophy

The determination of peak flows of the various drainage zones were calculated by using the Rational Method. The calculations are based on the post development scenario. The minor and major systems will be designed to accommodate a 1:2 and 1:25 year design flood respectively.

Roads will form an integral component of both the major and minor system. The kerb inlets will be designed to accommodate the 1:5 year flood. The class 4 roads have further been designed to accommodate the major floods in which case the roadway will be flooded, but the depth of flow will not exceed 150mm at the crown of the road. Class 5 roads can be flooded up to 80% of the road width during minor floods and the full road reserve can be flooded during major floods.

## 8.3 Stormwater Attenuation

It is a requirement of JRA that provision is made for stormwater attenuation to reduce the increased stormwater run-off resulting from the development to pre-development volumes through the incorporation of stormwater attenuation ponds in the stormwater system. Attenuation was calculated to ensure that outflows do not exceed the undeveloped calculated floods.

Due to the topography, gradients, general drainage and existing structures on the proposed site, it would be favourable to utilise the existing dam in the flood area as well as the provision of four new dams located at various positions for attenuation purposes. The capacity of the existing dam will be increased as a flood prevention measure.

The western and eastern areas of the development require a volume of approximately 16 000m<sup>3</sup> and 12 000m<sup>3</sup> respectively to be attenuated in 2 to 4 dams. The drainage areas and calculations are attached as Annexure E2.

There are also various storm water management systems installed in the flood area of the proposed site.

## 8.4 Proposed Stormwater System

Stormwater will be collected and transported by means of an underground pipe system and discharged in the attenuation dams or the open field as indicated in Annexure E1. The stormwater is mostly removed from the site in the roads. Open channels or energy dissipation structures will be constructed where stormwater pipes daylight next to the development or in the floodline area.

The proposed stormwater system for the South Hills Extension 2 development is divided into infrastructure required to drain the minor stormwater flood (1:5 year recurrence period) and the major stormwater flood (1:25 year recurrence period).

The minor stormwater system consists primarily of lateral kerb inlets, junction boxes, field inlets, overflow channels and pipe culverts (pre-cast concrete spigot and socket pipes with rubber rings). Pipe culverts vary in size from 450mm up to 1200mm.

The major stormwater system primarily consists of pipe culverts and rectangular channels (covered and open). These channels are placed within municipal stands or within road reserves. Channels in municipal stands are usually open. Rectangular channels in the road reserves are always covered.

Bulk inlets were designed for draining the major stormwater discharge from road reserves into the pipe system.

## 8.5 Technical Design Guidelines and Standards

Technical design guidelines are summarized in Table 8.1 below. A run-off coefficient of 0.8 will be used in the calculation of the peak flows.

**TABLE 8.1: Stormwater Design Guidelines**

No	Description	Guideline
1	Design Flood Determination Method	Rational Model
2	Average Annual Precipitation	740 mm
3	Design Flood Recurrence Interval	5 years and 25 years

Standard details will be based on the standards of Jo'burg Roads. Other specific standard details required on the project will be prepared and submitted to Jo'burg Roads for approval.



## 9. ESTIMATED CONSTRUCTION COST

The cost estimates provided here are only preliminary and for guideline purposes and has to be refined at a later stage through detailed designs. Due to the general geology of the proposed development area, it is estimated that roughly 50% of the soil can be classified as “hard excavation”. This will create a situation of excavation difficulty which translates to additional cost for the installation of engineering services.

The bulk services contributions will be determined as the proposed development phases progress and cannot be determined at this time. The City Council is to give guidance on the bulk services contribution rates. These cost estimates are once again only estimates and will have to be finalized and confirmed prior to proceeding with the project and applications. The following cost estimates that will be vital for the completion of this project that cannot be estimated at this stage are:

- Contribution to the provision of bulk engineering services to the Council. The amount payable is normally calculated after proclamation of any rezoning or township establishment application.
- Upgrading of Link and Bulk Roads and intersection upgrading. These can only be determined after the traffic impact study is completed.
- Upgrading of existing water lines and storage.

The cost of the internal services was estimated using typical current rates and is summarised below. The estimate includes P's and G's, Professional fees, escalation and contingencies. Excluded are VAT, disbursements and site supervision fees.

### 9.1 Bulk and Link Services

The bulk and link services costs will be determined after all studies are done.

### 9.2 Internal Services

The total estimated internal cost estimate for the proposed South Hills Extension 2 development can be seen below:

Service	Fleurhof Extension 5
Water reticulation	R15,500,000.00
Sewer reticulation	R22,500,000.00
Roads and Stormwater	R103,000,000.00
Sub-Total	R141,000,000.00

# ANNEXURE A1

## Locality Plan

# ANNEXURE A2

## Layout Plan

# **ANNEXURE B1**

## **Bulk Water**



# **ANNEXURE B2**

## **Water Layout Plan**

# **ANNEXURE C1**

## **Bulk Sewer**

# **ANNEXURE C2**

## **Sewer Layout Plan**

# **ANNEXURE D1**

## **Bulk and Link Roads**



# **ANNEXURE D2**

## **Roads Layout Plan**

## **ANNEXURE D3**

# **Typical Cross Sections of Streets & Services**

## **ANNEXURE E1**

# **Bulk and Internal Stormwater Layout Plans**

## **ANNEXURE E2**

# **Stormwater Drainage Areas and Calculations**